DO STOCK RETURNS TRIGGER ECONOMIC GROWTH?

EVIDENCE FROM TURKEY

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ABSTRACT

The link between stock markets and macroeconomic variables has been widely studied as an indicator for the investment behavior of agents in the economy. The stock returns have a direct relation with the macroeconomic variables such as inflation and growth. This paper does not only consider the bi-variate relationship between economic growth and stock returns but also accounts for the interest rates and inflation in Turkey between 1997:1 and 2008:6. Growth, stock returns and interest rates are transformed into real terms and an unrestricted VAR Model is developed. The Granger causality tests are applied to see whether innovations in real stock returns have an impact on real activity and/or interest rates, and in return, whether innovations in real growth and/or real interest rates cause changes in stock markets. Empirical results show that over the period we study causality runs from stock returns to real growth and from interest rates to real growth, whereas none of the other variables have a significant causality test result. The most interesting finding is that empirical results over 2002:1-2008:6, after the 2001 Crisis, indicate that the link between real growth and real stock returns has disappeared. Possible explanation for this reversal is the rising foreign share in the Istanbul Stock Exchange, thus weakening the link of stock market with the growth.

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1. INTRODUCTION

The link between stock markets and macroeconomic variables has been widely studied because of the fact that as an indicator for the investment behavior of agents in the economy the stock returns have a direct relation with the macroeconomic variables such as inflation and growth. Specifically, Sawhney et al. (2006) suggest the functions of the stock market as "mobilization of savings, creation of liquidity, diversification of risk, improvement of dissemination and acquisition of information, and enhanced incentive for corporate control". Sawhney et al. (2006) emphasize the major contribution of liquid equity markets to lead economic growth by reducing the risk related to investment. Besides, though with a limited effect, increasing stock prices cause a rise in consumption because people feel richer. Another link between stock prices and growth arises from the q-theory that suggests as stock prices are increasing more investments are being undertaken (Brainard and Tobin, 1968). Early study by Goldsmith (1969) shows that there is a positive correlation between the financial intermediary assets as percentage of GDP and growth rates for 35 countries, including Turkey. Following studies of Bosworth et al. (1975), Barro (1990), Fama (1981, 1990), and Schwert (1990) support the high correlation between stock returns and future real activity. An opponent approach suggesting that the liquidity of stock markets slow down the growth is explained by Demirgüç-Kunt and Levine (1996). They claim that the net impact of change in stock returns on saving rates would be ambiguous.

Overall, there is not a common view on the link between macroeconomic variables and stock market. Especially, for Turkey the number of studies is limited and results are inconsistent, varying from one time period to another as well as from one technique to another (Kargi and Terzi, 1997; Sari and Soytas, 2005; Karagoz and Armutlu, 2007; Erbaykal and Okuyan, 2007).

The basic aim of this paper is to analyze the causality relationship between real stock returns, real growth and real interest rates in Turkey over the period 1997-2008. This study does not only use a more recent dataset but also tests the causality via Toda-Yamamoto procedure (Toda and Yamamoto, 1995). Besides, the sensitivity of results to the 2001 crisis is

investigated. Main results show that over the whole period of 1997-2008, the Granger causality goes from real stock returns to growth. However, after crisis there is no significant causality between growth and stock returns. Furthermore, in the real interest rate equation both stock returns and growth become significant after the 2001 Crisis. This change in economic structure can be explained by the rising foreign custody ratios in Istanbul Stock Exchange, especially after 2001, and substitutability of interest rates to stock market returns.

This paper is organized as follows; in Part 2 the literature on the link between growth and stock returns is revisited; in part 3 data and methodology are introduced. Part 4 discusses the empirical results and lastly, Part 5 presents a brief conclusion.

2. LITERATURE REVIEW

Early study by Bosworth et al. (1975) demonstrates the leading role of stock returns for economic activity. Fama (1981) relates stock returns, inflation, interest rates and real economic activity via regression analysis. The results of Fama (1981) also reveal that the stock returns are positively related to real economic activity. Another study by Fama (1990) finds out that the growth rates of production explains 43 per cent of the variance in stock returns. The study of Fama (1990) is extended with an additional of 65 years of data by Schwert (1990). With 100 years of data, Schwert's (1990) results strengthen the Fama's (1990) finding of positive relation between stock returns and real activity. VARMA (Vector Autoregressive Moving Average) Model estimation results of James et al. (1985) claim that there is strong positive link between stock returns and real economic activity, and stock returns signal changes in nominal interest rates. The regression analysis of Barro (1990) confirms the significant explanatory power of changes in stock prices for investments in the U.S. and Canada even during the stock market crashes of 1929 and 1987.

Canova and Nicolo (2000) consider the U.S., Japan, Germany and the U.K. from 1973 to 1995. Nevertheless, only for the U.S. the relation is found to be significant. Unrestricted VAR (Vector Autoregressive) analysis shows that there is not a relation between stock returns and real growth. Nevertheless, term structure of interest rates can predict the future real activity. On the other hand, Hassapis and Kalyvitis (2002) examine G-7 countries over 1950-1996 and

find out positive effect on growth and real stock returns given a positive shock in real stock prices, even though the length of output response differs from one country to another. Mauro (2003) covers a large data set, including Turkey, from 1970's to 1998 to examine the relation between output growth and lagged stock returns. Mauro (2003) claims that the stock market should be taken into account to forecast output in both developed and developing countries. He also finds that this link is stronger for the countries "with a high market capitalization to GDP ratio, a large number of listed domestic companies and initial public offerings, and English origin of the regulations governing the stock market". Country-specific equation for Turkey shows that the correlation between stock returns and industrial production (or GDP) is positive but insignificant. Nevertheless, he concludes by stressing that the empirical results can be time-dependent without sufficient explanation on the causal relation. Binswanger (2004) examines the real stock prices, industrial production index and real GDP of the U.S., Canada, France, Germany, Italy, Japan, U.K. and G-7 Europe over 1960-1999. In his paper, the Johansen and Engle-Granger Tests for cointegration are not robust to changes in the sample period and the number of lags. Therefore, the study presents both OLS regression and VECM results together with CUSUM and Chow Breakpoint Tests. Chow test in the OLS regressions and CUSUM test indicate that for the U.S., Japan and G-7 countries the coefficients are instable and there is a structural break in 1983. For Canada and Italy, the coefficients are instable but the structural break points occur either before or after 1983. Only for France and the U.K. the results are stable. The empirical findings support that the link between stock returns and economic growth, which had been found for the U.S. by Binswanger (2000) in the early 1980's, is broken not only for the U.S. but also for other selected countries. Binswanger (2004) explains the breakdown of the relation in possible ways. First possible explanation suggested is the "emergence of speculative bubbles" that causes deviation of stock prices from their fundamental values. Other approaches are "shocks to discount rates or variation in risk premia" (Lee, 1998) and rising interdependence of stock exchanges (Longin and Solnik, 1995; Meric and Meric, 1997; Wu and Su, 1998; Rangvid,

2001). Whatever the underlying cause, Binswanger (2004) underlines the breakdown of the link as an international phenomenon.

The study of Enisan and Olufisayo (2009) focuses on the impact of stock market development on economic growth for 7 sub-Sahara African countries over 1980-2004. Their study considers the Granger Causality Tests based on VECM and VAR models to prove the effect of market capitalization ratio and value traded ratio on long run economic growth measured with per capita nominal GDP. The causality test results on VAR indicate that there is a bidirectional relation for Cote D'Ivoire, Kenya, Morocco and Zimbabwe. All results confirm the importance of stock market to promote the growth in Africa.

As an alternative to Granger Causality tests, Hassapis (2003) suggests a non-parametric approach, Kernel based long-run covariance matrix, to investigate the link among output, real stock price changes, interest rates, interest rate spreads and monetary aggregates for Canada and the U.S. from 1966 to 2000. In line with the parametric approaches, their results support the predictive power of stock returns for economic growth.

Some studies present controversial results on the link between growth and stock returns. Flannery and Protopapadakis (2002) identify the macroeconomic variables affecting the stock market returns in the value-weighted NYSE-AMEX-NASDAQ market index via a GARCH model. They specify three nominal (CPI, PPI, and a Monetary Aggregate) and three real (Balance of Trade, Employment Report, and Housing Starts) variables that have an impact on stock returns, which do not include the economic growth contrary to expectations. Another study by Ritter (2005) makes a stronger claim stating that the correlation between real stock returns and per capita GDP growth is even negative over 1900-2002. The study of Ritter (2005) considers the simple correlation between geometric mean annual real stock returns and arithmetic mean real per capita annual GDP growth for 19 countries over 33 years and 13 countries over 15 years. The explanation of this reversal is the source of growth: technological change and reinvestment in existing firms or cash flow into new firms. Ritter (2005) argues that technological change benefited labor and consumers but not the owners of capital.

An interesting study of Baier et al. (2004) considers the impact of opening a stock exchange in a country on its economic growth. Even though their results do not reveal a causal relation, the findings indicate that after creation of a stock exchange a country grows higher than the rest of the world, verifying a feedback between economic growth and stock returns. Another study of Chang and Pinegar (1989) distinguishes the returns on small and large firms and investigates the link between the returns series and industrial production growth. In aggregate level, their least square regression results confirm that "stock returns reflect real activity", but especially for large firms, stock returns lead the growth 6 months in advance whereas small firms' returns lead only one-month.

A number of other studies consider not only the effect of stock returns on growth but also of the banking sector; their results also confirm the positive relation between economic growth and stock returns even incorporating the banking sector. Beck and Levine (2004) examine the turnover ratio and bank credit ratios of 40 countries as proxy for stock market development and bank development indicators, respectively. Their GMM results over 1976-1998 state that for growth equation both stock market and bank development significantly matters. Levine and Zervos (1998) also find significant bank and stock market development variables for growth. They emphasize the essential role of financial factors in growth process and distinguish the effect of stock markets than of banking sector. Contrary to Levine and Zervos (1998), the study of Liu and Hsu (2006) find insignificant and even negative coefficients for market turnover ratio for Taiwan and Korea. Only for Taiwan, Liu and Hsu (2006) are able to prove the contribution of stock market development to growth. Arestis et al. (2001) use the real GDP, stock market capitalization ratio as percentage of GDP and ratio of domestic bank credit to nominal GDP for Germany, Japan, the United States, the United Kingdom and France to test the promoting impact of banking system and stock market. Their results underline the promoting role of both banking system and stock market as well as the more powerful role of banking system. Another study by Hondroyiannis et al. (2005) investigates the relation among total bank credit available (also commercial bank credit to industry) as percentage of GDP, total market (also industrial) capitalization divided by GDP,

and real GDP in Greece as a representation of the link among development of the banking system, stock market development and economic performance, respectively. VAR analysis of Hondroyiannis et al. (2005) implies that a bi-directional causality exists between real economic performance and stock market capitalization as well as between real economic activity and bank credit. Besides, the stock market has a limited contribution on growth compared to banking system, supporting Arestis et al. (2001). On the other hand, a recent study of Deidda and Fattouh (2008) agree on the significant effect of bank and stock market development on growth by using Demirgüç-Kunt and Levine (2001) cross-country data set, but for higher levels of stock market development, the positive impact of bank development becomes lower. Deidda and Fattouh (2008) draw attention to interaction between bank and stock market development. Cole et al. (2008) find out positive relation between the economic growth and banking industry stock returns. Their results claim a significant predictive power of banking industry stock returns for future economic growth in 18 developed and 18 emerging markets. Besides, they state that this positive and significant link is independent from the relation between economic growth and stock returns found by Fama (1981, 1990) and Schwert (1990). On the other hand, there are a number of studies that could not find any significant or report ambiguous relations between growth and financial development (Ram, 1999; Dawson, 2003; Naceur and Ghazouani, 2007). Also, for Turkey there is not a consensus on the relation between financial development and growth (Kandır et al., 2007)

Considering the studies particularly on Turkey, Kargi and Terzi (1997) present a VAR model of stock returns, growth, interest rates and inflation, and find out that industrial production index is not affected by any other variable -only by its lagged values- for the period 1986:1-1996:6. Kargi and Terzi (1997) fail to find a meaningful interaction between growth and the Istanbul Stock Exchange (ISE). They also claim that inflation rates and interest rates explain substantial fractions of their forecast error variances in a bi-directional way. Another study by Sari and Soytas (2005) finds a positive relation between the real stock returns and real economic activity based on a VAR approach over 1986:1-2000:12. Karagoz and Armutlu (2007) study a more recent dataset from 1988 to 2006 (with quarterly data) to

investigate the Granger Causality between growth and stock returns. Their results show that the economic growth Granger causes stock market growth, but not vice versa. However, their study considers only two variables in a dynamic model. Another study by Erbaykal and Okuyan (2007) applies Toda and Yamamoto procedure to test causality among exchange rates, stock prices, inflation, growth and interest rates. The Granger causality goes from stock prices to economic growth and from interest rate to stock prices.

This study aims to re-analyze the link among real growth, real stock returns, and real interest rates for Turkey to shed more light on the debate about the relationship between stock returns and growth. We expand the time period of previous studies for Turkey to question whether innovations in real stock returns affect real activity and, in turn, whether innovations in growth cause changes in stock markets. Besides, this paper does not only consider the real economic growth and real stock returns but also accounts for the interest rates because the interest rates have a direct impact on growth since they affect investment and consumption, and can be thought of as representing returns on alternative investments to the stock returns. Previous studies, such as Kargi and Terzi (1997) and Erbaykal and Okuyan (2007) on Turkey, and James et al. (1985) and Sawhney et al. (2006) on other countries, include interest rates. Sawhney et al. (2006) adopt a VAR model of stock returns, growth, short-term and long-term interest rates for the US and Canada. Their results imply a bi-directional causality for Canada; causality from economic growth to stock returns and bi-directional causality between stock returns and interest rates for the US. These findings indicate that VAR model of stock returns and growth would need to incorporate interest rates. Lastly, this study adopts Toda and Yamamoto (TY) procedure to apply Granger causality tests, where variables with different degree of integration could be used without needing to test for cointegration.

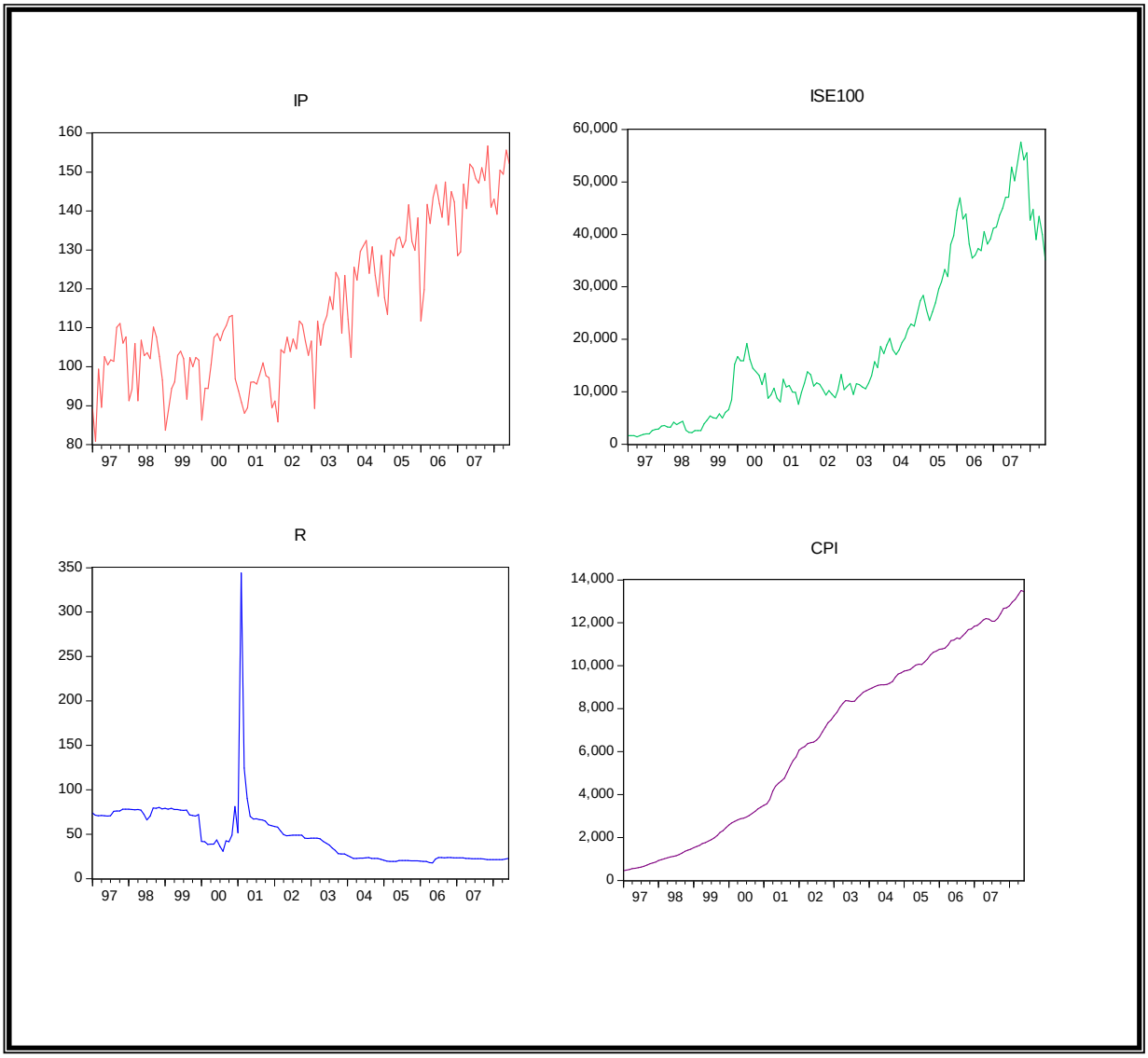
3. DATA AND METHODOLOGY

This paper uses Industrial Production Index, Consumer Price Index, Istanbul Stock Exchange Price Index 100 (ISE 100) and monthly interest rates on deposits as a proxy to real activity, inflation, stock returns and interest rates, respectively. Unrestricted VAR Model is

constructed together with Granger Causality tests. Monthly industrial production index (IP) and monthly interest rate as weighted averages of 1-month deposits are acquired from the Central Bank of the Republic of Turkey. 1994 based consumer price index is gathered from the Turkish Statistical Institute. Lastly, closing values of ISE 100 are found at the web site of the Istanbul Stock Exchange. Stock returns, industrial production index and interest rates are transformed into real terms by dividing with consumer price indices. All series cover the period from 1997:1 to 2008:6. The changes of variables in log form are considered to represent growth rates.

A visual investigation of the selected variables is next. In Figure 1 all variables (at levels) are graphed against time. ISE 100, IP and Consumer Price indices have an upward trend over the selected period. Monthly deposit rates follow a declining path, except 2001 crisis. Even though there is no one to one relation between ISE 100 and IP indices, there seems to be dependence among them. In other words, one can have explanatory power to explain the changes in the other one. According to the economic theory we would expect that given all others constant an increase in production index would mean higher growth rates so that in a growing economy the agents would invest more, including the stock market investments. From a different angle, considering all others constant, an upward trend in stock returns can be an indicator of higher investments, which is considered under the total investments in the economy, leading to higher growth. Starting from this point it is questioned whether the real stock returns triggers real economic growth in Turkey or whether the growth promotes higher stock returns. Since the direction of the relation between real economic activity real stock returns, and interest rates is unknown, this leads us to the implementation of the VAR Model.

FIGURE 1. Industrial Production Index, ISE-100, Consumer Price Index and Interest Rates in Turkey (1997:1-2008:6):



The VAR model for the system of real growth, real stock returns and real interest rates can be written as follows:

$$\Delta RLIP_t = \alpha_1 + \sum_{i=1}^{p} a_{1i}\Delta RLIP_{t-i} + \sum_{k=1}^{r} b_{1k}\Delta RLISE_{t-k} + \sum_{l=1}^{s} c_{1l}\Delta RIR_{t-l} + d_1 t + \Omega_1 DUM + e_{1,t} \qquad (1)$$

$$\Delta RLISE_t = \alpha_2 + \sum_{i=1}^{p} a_{2i}\Delta RLIP_{t-i} + \sum_{k=1}^{r} b_{2k}\Delta RLISE_{t-k} + \sum_{l=1}^{s} c_{2l}\Delta RIR_{t-l} + d_2 t + \Omega_2 DUM + e_{2,t} \qquad (2)$$

$$\Delta RIR_t = \alpha_3 + \sum_{i=1}^{p} a_{3i}\Delta RLIP_{t-i} + \sum_{k=1}^{r} b_{3k}\Delta RLISE_{t-k} + \sum_{l=1}^{s} c_{3l}\Delta RIR_{t-l} + d_3 t + \Omega_3 DUM + e_{3,t} \qquad (3)$$

where RLIP, RLISE, RIR denote real industrial production index, real stock prices and real interest rates, respectively. 'L' represents the natural logarithm of a variable. Δ represents the first difference of the corresponding variable. α's are the constant terms; e's are the Gaussian error terms. Dummy variable for 2001 crisis is introduced with 'DUM' that takes 1 for 2001:2 and before; 0 otherwise. Depending on the trend pattern observed from Figure 1, trend variable 't' is incorporated to the equations.

The VAR model allows applying Granger Causality tests to observe whether lags of one variable explain current value of another variable. To illustrate; if lags of real stock returns in log have explanatory power in the growth equation (Equation 1), then b_{2j} must be significant. In this case, if lags of growth rate are not significant in the stock returns equation, then the causality would be uni-directional and running from stock market to growth. If coefficients of the lag terms of each variable are significant in each others equation, then the causality could also be bi-directional. If none of the lagged terms are significant then Granger causality does not exist. Therefore, the significance of all coefficients, a_{1i}, a_{2i}, a_{3i}, b_{1j}, b_{2j}, $b_{3j,}$ $c_{1k,}$ c_{2k}, c_{3k}, would be tested to specifically understand whether the causality exists, and if it exists, whether it goes from stock returns to growth or vice versa or both. The nature of the VAR modeling approach rests on the equal lags of all variables in the system. Furthermore, unlike the Johansen approach the TY approach can be used in the face of arbitrary integration orders of variables in concern.

Unit root tests of RLIP, RLISE, and RIR show that RIR is integrated of order zero whereas RLIP and RLISE are integrated of order one[3]. Therefore, Toda and Yamamoto (1995) procedure is applied. The TY procedure enables us to examine the relation among variables without testing for cointegration between the variables. Hence, a possible bias in the cointegration tests is not carried into the analysis. The basic requirement of TY procedure is to identify the maximum order of integration from the selected variables. Assuming that the maximum order of integration is d, TY procedure requires choosing a VAR model with

[3] To test the order of integration, Augmented Dickey and Fuller (1979) (ADF), Phillips and Perron (1988) (PP), Elliot, Rothenberg, and Stock's (1996) Dickey-Fuller GLS detrended (DF-GLS) and Point Optimal (ERS-SPO), Kwiatkowski, Phillips, Schmidt, and Shin (1992) (KPSS), and Ng and Perron (2001) (NP) tests are adopted.

optimum lag length of k. Then, VAR(k+d) model enables to apply the causality tests via Wald test: equating first k coefficients of the variable to zero (i.e., for a given k=3, to test the effect of changes in past stock returns on the change in real growth, the null hypothesis of the Wald test would be $b_{11}=b_{12}=b_{13}=0$). If the Wald test result concludes the alternative hypothesis, then that variable is said to have a long run causal impact on the dependent variable. The causality is interpreted as long run causality, since there are no first differences in the lag augmented VAR of the TY procedure.

4. EMPIRICAL RESULTS

As a first step of TY, an optimum lag length of 6 (k=6) is chosen[4]. Since the maximum order of integration is d=1, VAR (6+1) Model is estimated. The diagnostic tests for VAR(7) Model is given in Table 1[5].

TABLE 1. Diagnostic Tests on VAR(7) (1997:1-2008:6):

EQUATION	BG (2)	JB	BPG	ARCH LM	White	RESET	QA
Real Industrial Production Index	0.3646	13.3019 [a]	15.7472	0.3398	15.8647	0.1845	7.8381
Real Stock Market Index	4.6999 [c]	38.8404 [a]	23.0789	1.3051	20.4465	0.2624	4.3048
Real Interest Rates	3.3268	13,216 [a]	43.6044 [a]	0.0111	40.5611 [b]	4.2526 [b]	503.54 [a]

Notes:
1. The entries are the relevant test statistics. Breusch-Godfrey (BG) test null is no serial correlation. Jarque-Bera test (JB) null is normality of residuals. Bresuch-Pagan-Godfrey (BPG) test null is no heteroscedasticity. ARCH test null is no ARCH up to lag 1. White test is without cross terms and null is no heteroscedasticity. Ramsey RESET test null is no specification errors and is conducted for one fitted term using LR. Quandt-Andrews (QA) breakpoint test is conducted using first lags of the variables with 15% trimming and only the maximum F statistics are reported.
2. Superscripts a, b, and c represent significance at the 1, 5, and 10% respectively.
3. For real interest rates equation, Quandt-Andrews test is significant for the date 2001:2 where the dummy is introduced at.

Source: Calculations at E-views

According to the results, there is a significant departure from normality. Especially, for real interest rate equation there seems to be a specification error (due to the RESET test).

[4] The optimum lag length order is chosen based on Akaike Information Criterion. VAR models at different lag lengths are also compared based on Breusch Pagan Godfrey, Jarqua Bera, ARCH LM, White, Ramsey Reset and Breusch Godfrey Tests. Inverse roots of each VAR model is also drawn for stability.

[5] The inverse roots of VAR(7) are all within the unit circle.

Considering the volatile structure of interest rates in Figure 1, it is not surprising to find evidence for heteroscedasticity and breakpoint in 2001:2. Therefore, heteroscedasticity consistent estimators are used for the last equation. For real growth and real stock market returns equations, there is not a significant heteroscedasticity or autocorrelation problem[6].

To comment on the long run causal relation among the variables, the Wald test on first 6 coefficients of each variable in each equation is conducted. The Granger Causality test results are presented in Table 2. Over 1997:1-2008:6 period the real interest rates and real stock

TABLE 2. Granger Causality Test Results on VAR(7) (1997:1-2008:6):

	VARIABLES		
EQUATIONS	**Real Industrial Production Index**	**Real Stock Market Index**	**Real Interest Rates**
Real Industrial Production Index	-	14.7095 [b]	12.3367 [c]
Real Stock Market Index	2.6310	-	6.9202
Real Interest Rates	1.8069	6.3424	-

Notes:
1. The entries are ChiSquare statistics acquired via Wald Coefficient Test.
2. Superscripts a, b, and c represent significance at the 1, 5, and 10% respectively. Significance implies that the column variable Granger causes the row variable.
3. For 'Real Interest Rates' equation, Newey-West HS consistent estimates are considered.

Source: Calculations at E-views

returns Granger causes real growth. However, the causality is not bi-directional; real growth does not Granger cause real stock returns. Indeed, no other variable's past values significantly enter an equation. This result partially supports the study of Kargi and Terzi (1997) but opposite of the findings of Karagoz and Armutlu (2007). Different from the study of Erbaykal and Okuyan (2007), where the TY procedure is adopted similar to our approach, there is no Granger causality from interest rates to stock returns even though causality goes from stock market to growth. None of the time spans examined in these articles overlaps with the time period of this study. Our dataset considers a more recent time period. None of the

[6] According to the CUSUM test results, only for growth equation the cumulative sum of recursive residuals goes beyond 5% cirtical lines between 2003 and 2006. The CUSUM of squares test indicate parameter instability only for real interest rates equation and only slightly. Therefore, the estimated parameters are somewhat stable.

studies investigate the impact of economic or financial crisis on the relationship between stock returns and growth in Turkey. Therefore, we additionally test whether the 2001:2 Crisis has changed the causality relation between real growth and real stock returns or not, a possible explanation for the controversial results on causality compared to previous work.

TY procedure is also applied for the time period starting from 2002:1 to 2008:6[7]. Similarly, maximum order of integration is determined as 1 and VAR(5) is chosen based on Akaike Information Criteria and diagnostic tests. Then, VAR(5+1) is run to investigate long run causality[8]. The diagnostics for VAR(6) are given in Table 3. Different from all period, there is no normality problem after the crisis. Nevertheless, the real interest rate equation still suffers from misspecification and heteroscedasticity problem. Breusch-Godfrey test detects autocorrelation problem for real growth equation. There is no structural break after the crisis period[9].

TABLE 3. Diagnostic Tests on VAR(6) (2002:1-2008:6):

EQUATION	BG (2)	JB	BPG	ARCH LM	White	RESET	QA
Real Industrial Production Index	15.1338 [a]	3.7606	20.9436	0.5182	24.0293	0.4019	4.7193
Real Stock Market Index	1.9042	1.7245	19.7747	0.2328	18.7028	0.3360	4.7275
Real Interest Rates	1.1743	1.5091	37.9542 [a]	8.5566 [a]	32.1444 [b]	7.2268 [a]	8.5762

Notes:
1. The entries are the relevant test statistics. Breusch-Godfrey (BG) test null is no serial correlation. Jarque-Bera test (JB) null is normality of residuals. Bresuch-Pagan-Godfrey (BPG) test null is no heteroscedasticity. ARCH test null is no ARCH up to lag 1. White test is without cross terms and null is no heteroscedasticity. Ramsey RESET test null is no specification errors and is conducted for one fitted term using LR. Quandt-Andrews (QA) breakpoint test is conducted using first lags of the variables with 15% trimming and only the maximum F statistics are reported.
2. Superscripts a, b, and c represent significance at the 1, 5, and 10% respectively.

Source: Calculations at E-views

[7] The year 2001 is not included for after-crisis analysis since this deep crisis had permanent effect on selected variables.
[8] Inverse roots of VAR(7) are all in unit circle.
[9] Only for real interest rate equation for CUSUM test there is an indication of instability. For other equations, CUSUM and CUSUM of squares tests verify the stability of parameters.

Equating first 5 coefficients of each variable in each equation to zero, the Wald Tests are carried out (Table 4). Comparison of Table 2 and 4 underlines important facts. Firstly, after the crisis the link between real stock returns and real growth totally disappears. Secondly, for the last equation both real growth and real stock returns Granger causes real interest rates, but in Table 2, none of the variables are significant. Lastly, the Granger causality from real interest rates to real growth still continues.

Full sample and post-crisis analysis suggests a structural change in the Turkish economy. Even though the bi-directional causality from real stock returns to real growth is weak over the whole period (at 5% significance level), the explanatory power of changes in past real stock returns utterly disappears after the 2001 Crisis. This result suggests detaching dynamics of real growth and real stock returns. One possible explanation is the rising foreign

TABLE 4. Granger Causality Test Results on VAR(6) (2002:1-2008:6):

	VARIABLES		
EQUATIONS	**Real Industrial Production Index**	**Real Stock Market Index**	**Real Interest Rates**
Real Industrial Production Index	-	3.8380	15.1474 [a]
Real Stock Market Index	2.8947	-	0.8772
Real Interest Rates	9.7075 [c]	11.1131 [b]	-

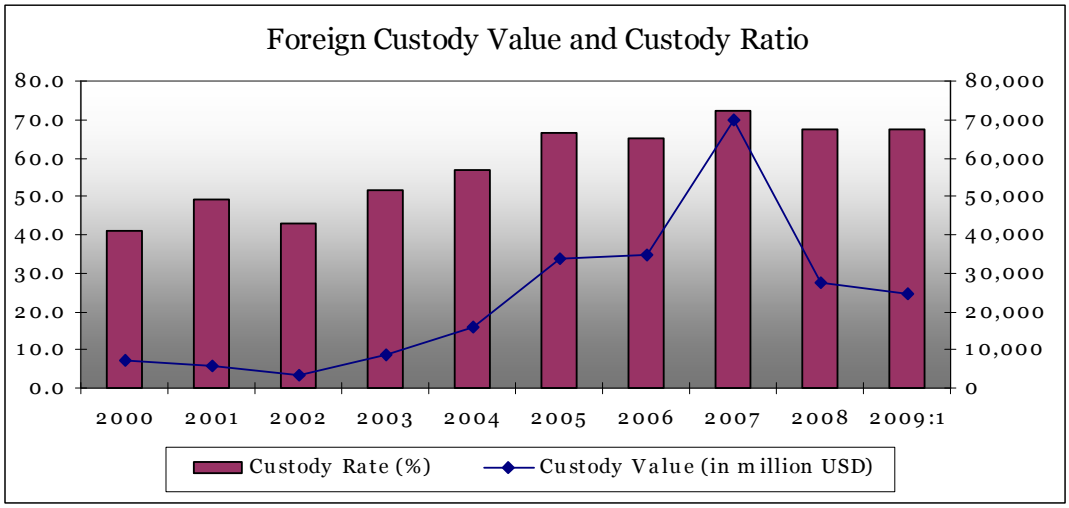
Notes:
1. The entries are ChiSquare statistics acquired via Wald Coefficient Test.
2. Superscripts a, b, and c represent significance at the 1, 5, and 10% respectively. Significance implies that the column variable Granger causes the row variable.
3. For 'Real Interest Rates' equation, Newey-West HS consistent estimates are considered.

Source: Calculations at E-views

share in Istanbul Stock Exchange. The increasing share of foreign investors in ISE may cause an increasing disconnection between real growth in the domestic economy and stock exchange dynamics. In Figure 2, the foreign custody ratios are presented, where this value reaches well above 70%. The increasing foreign share enables us to understand the real interest rates equation. In place of real stock returns, the real interest rates, representing

returns on alternative investments, may correlate with the real growth. This explains the finding of Granger causality from real stock returns to real interest rates.

FIGURE 2. Foreign Custody Ratio in the ISE (2000-2009:1):



Source: Capital Markets Board of Turkey, January 2009 Monthly Bulletin

5. CONCLUSION

The impact of changes in the stock markets on different macroeconomic variables plays an important role to direct policies. Most of the previous studies show a long run relation between stock returns and real activity. Nevertheless, the studies on Turkey do not indicate a common view on this link. This paper adopts a recent dataset from 1997:1 to 2008:6 to investigate the causality among stock returns, real growth and interest rates by using the TY procedure. The results over whole period show that there is bi-directional causality running from stock markets to growth. On the other hand, the link between growth and stock returns utterly disappears over 2002:1-2008:6. After 2001, causality from real stock returns and real growth to real interest rates becomes significant. One possible explanation for this reversal is the rising share of foreigners in the ISE (coming to a peak point at 72.4% in 2007). High custody values in the ISE weaken the link of stock exchange markets with the national macroeconomic dynamics. In addition, the real interest rate becomes an alternative investment opportunity to stock markets. This explains the significance of coefficients in the real interest rate equation after crisis.

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